

IDENTIFICATION AND BIOLOGICAL NOTES ON THE
SPECIES OF *NEOCHETINA* THAT ATTACK
PONTEDERIACEAE IN ARGENTINA
(COLEOPTERA: CURCULIONIDAE: BAGOINI)¹

C. J. DELOACH²

Biological Control of Insects Research Laboratory, Agr. Res. Serv., USDA,
Hurlingham, Buenos Aires, Argentina

ABSTRACT

A key is given for the separation of *Neochetina bruchi*, *N. eichhorniae*, *N. affinis*, and *N. n. sp.* The major distinguishing characters and the characters for separating the sexes of each species are given, with illustrations. Information is included on the eggs, larvae, and pupae and on oviposition, host range, and behavior of adults.

Many water weevils of the tribe Bagoini have host ranges restricted to a few closely related plant species, and several have potential for biological control of aquatic weeds. Among these is the genus *Neochetina* that occurs on the plant family Pontederiaceae in South America. The members of the genus have recently been subjects of intense study as possible agents for biological control of waterhyacinth (*Eichhornia crassipes* (Mart.) Solms) (Andres and Bennett 1975). The genus *Neochetina* was erected by Hustache (1926) with the description of 2 new species, *bruchii* and *affinis*; he later added a third, *guadelupensis* (Hustache 1929). *N. eichhorniae* was found during the waterhyacinth investigations and was subsequently described by Warner (1970), who also stated that *guadelupensis* probably should not be included in the genus because it has a 7-segmented funicle. I found *Neochetina n. sp.* attacking *Pontederia lanceolata* Nutt. in the upper Río Paraguay watershed in the Mato Grosso area of Brazil in 1973, during the investigations on arthropods attacking waterhyacinth; H. A. Cordo³ subsequently found it on *P. lanceolata* in Formosa and Chaco provinces of northern Argentina. This species is currently being described by C. W. O'Brien⁴.

Some of the species of *Neochetina* are superficially very similar, and several workers have reported difficulty in identifying them, or in separating the sexes. The following notes are supplementary to the original descriptions and are useful in identifying living specimens in the field or in the laboratory.

Hustache (1926:222) characterized the genus as having a 6-segmented funicle, club of antennae finely pubescent, ocular lobes strongly devel-

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²Present address: USDA-ARS-Grassland-Forage Research Center, Temple, TX 76501.

³Letter April 18, 1975, from Ing. Agron. Hugo A. Cordo, Biological Control of Weeds Laboratory, USDA-ARS, Hurlingham, Buenos Aires Prov., Argentina.

⁴C. W. O'Brien. A taxonomic revision of the new world subaquatic genus *Neochetina* (Coleoptera: Curculionidae: Bagoini). In Press, Ann. Ent. Soc. Amer.

oped, tibia not grooved beneath, 3rd tarsal segment large and bilobed, anterior coxae very slightly separated, prosternum very short in front of the anterior coxae and strongly arched. The species may be separated as follows:

Key to the Species of *Neochetina*

- 1. Larger species (males more than 4.9mm, females more than 5.4mm long from anterior vertex to posterior tip of abdomen), slightly more than twice as long as wide, elytral interval 1 without carina (Fig. 7, 8) *affinis*
- 1'. Smaller species (males less than 4.6mm, females less than 5.2mm long), less than twice as long as wide, elytral interval 1 with carina (carina less distinct in n. sp.) 2
- 2(1'). Antero-medial tubercle of prosternum wide, in the form of a truncate "trough," front coxae widely separated (males 0.66 of or more the narrowest width of the rostrum); with distinct whitish spot at base of elytral suture (Fig. 1, 2, 11, 12, 20) n. sp.
- 2'. Antero-medial tubercle not as above; the 3 tubercles of prosternum behind coxae sub-equal in size and shape, front coxae proximate (0.33 or less the narrowest width of the rostrum), without conspicuous whitish markings 3
- 3(2'). Carina on elytral interval 1 short (0.33 or less the length of the thorax) and located behind the anterior margin of the elytra a distance sub-equal to the length of the thorax; front coxae moderately separated (0.33 of the narrowest width of rostrum); brown to tan (Fig. 5, 6, 9, 10, 17) *bruchi*
- 3'. Carina on elytral interval 1 long (0.5 or more the length of the thorax) and located behind the anterior margin of the elytra a distance about 0.5 the length of the thorax; front coxae proximate (separated by 0.1 of the narrowest width of the rostrum); dark brown to black (Fig. 3, 4, 13, 14, 18) *eichhorniae*

PRINCIPAL TAXONOMIC CHARACTERS

The principal characters for separating the 4 species of *Neochetina* are 1) the location of the carina and markings on the elytra, 2) the form of the tubercles on the prosternum, 3) the distance between the front coxae, and 4) the size and shape of the rostrum. This latter character alone is sufficient to separate the 4 species and the sexes of each (Table 1, Fig. 9-16). With experience, the species can be identified with the naked eye by the larger size of *affinis*, the white spot at the base of the elytral suture of the n. sp., the lighter color and frequently present tan chevron of *bruchi*, and smaller size and darker color of *eichhorniae*.

N. affinis Hustache

Largest species, length of male 5.33mm (5.0-5.8mm), of female 6.03mm (5.5-6.5mm); uniform brown or with indistinct irregular markings; carina of 1st elytral interval absent, some individuals with 2-3 rows of small tubercles on elytral intervals 3, 5, and 7 (Fig. 7, 8); front coxae proximate

(separated by 0.1 the narrowest width of rostrum); antero-medial tubercle of prosternum behind front coxae well developed but the 2 postero-lateral tubercles only slightly elevated (Fig. 19). Rostrum long and slender, that of female rather strongly curved, of male strongly curved and expanded beyond antennae, suprascrobal groove present in female, indistinct in male (Table 1, Fig. 15, 16).

Eggs elongate, large, length 1.01mm (0.90-1.17mm), width 0.50mm (0.47-0.53mm), ratio w:l = 1:2.01 (30 eggs measured).

Neochetina n. sp.

Medium size, length of male 3.94mm (3.6-4.3mm), of female 4.71mm (3.9-5.1mm); with several conspicuous whitish spots, particularly at the base of the elytral suture, on lateral aspect of the humeri, on posterior aspect of the femora, and the broad dark and white bands on the tibiae; carina on elytral interval 1 short (0.33 length of thorax) and located behind anterior margin of elytra a distance subequal to length of thorax; light tan chevron on elytra present on most individuals (Fig. 1, 2); antero-medial tubercle of prosternum broad and in the form of a truncate "trough," front coxae widely separated (male by 0.66 or female by 0.9 the narrowest width of the rostrum) (Fig. 20). Rostrum stout, very slightly curved, suprascrobal groove present, more distinct in female (Table 1, Fig. 11, 12).

Eggs similar to *bruchi*, 0.92mm (0.80-1.00mm), width 0.61mm (0.57-0.63mm), ratio w:l = 1:52 (24 eggs measured).

TABLE 1. CHARACTERISTICS OF THE ROSTRUM OF BOTH SEXES OF *NEOCHETINA* SPP.^a.

Rost./	Ant:	Mean length (mm) ^b	Rost./ thorax ratio ^c	Antenna: insert. ratio ^d
<i>N. affinis</i>	male	1.32	1.05	0.96
	female	1.58	1.13	1.48
<i>N. n. sp.</i>	male	1.17	1.11	0.89
	female	1.53	1.21	1.48
<i>N. bruchi</i>	male	1.23	1.04	0.65
	female	1.42	1.11	1.04
<i>N. eichhorniae</i>	male	1.10	1.03	0.66
	female	1.29	1.08	1.19

^a Mean of 10 individuals of each species and sex.

^b Measured from apex of epistoma to base of rostrum below eye.

^c Length rostrum/length thorax at mid-dorsal line.

^d Distance from apex of epistoma to insertion of antennae/maximum width of rostrum near apex.

N. bruchi Hustache

Medium size, length of male 4.18mm (3.5-4.5mm), of female 4.61mm (4.1-5.0mm); brown, many individuals with light tan chevron on elytra, others with indistinct tan spots on elytral intervals 1, 3, 5, and 7; carina

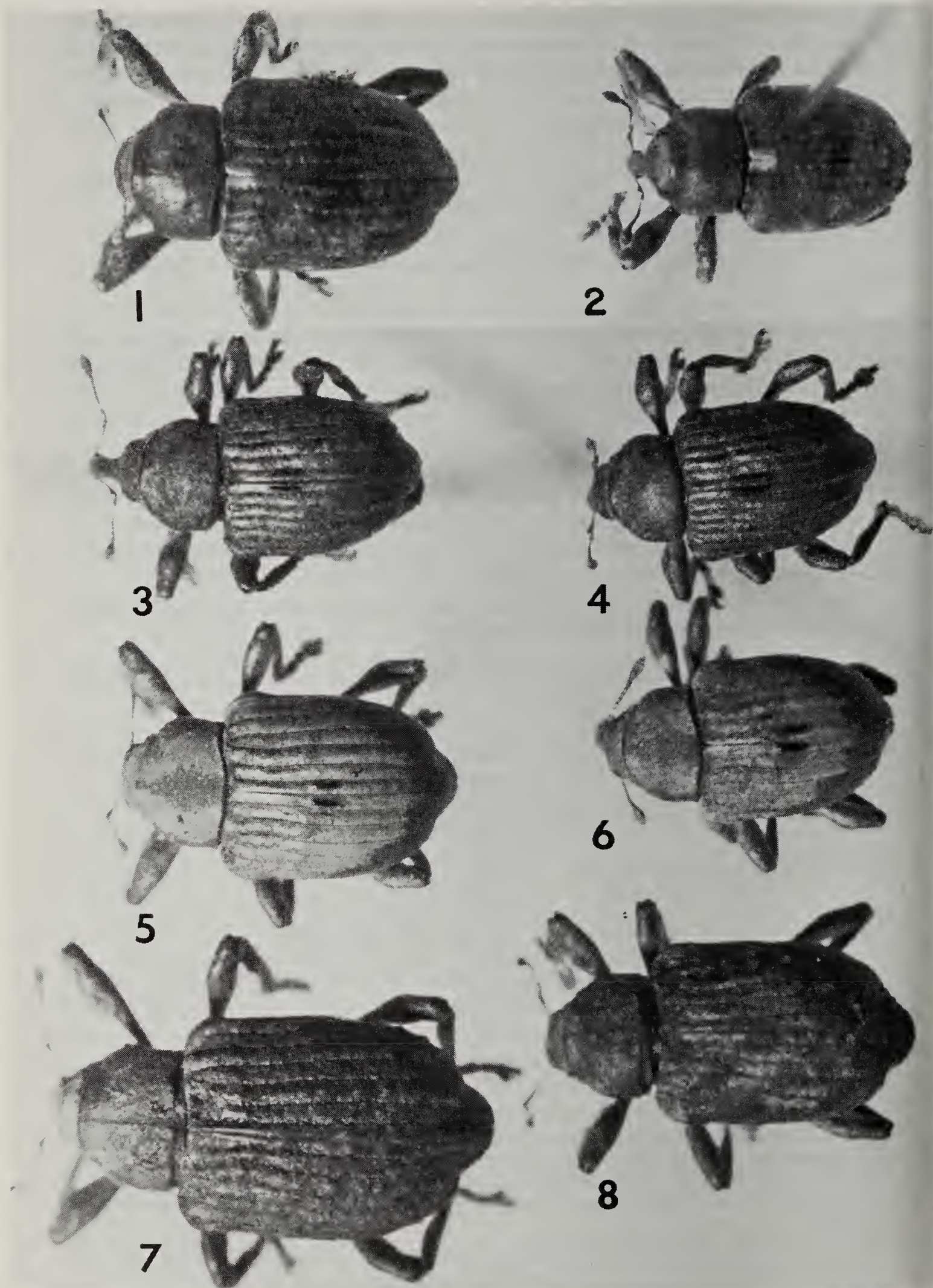


Fig. 1-8: Dorsal view of the 4 species of *Neochetina*; *N. n.* sp. female (1), male (2); *N. eichhorniae* female (3), male (4); *N. bruchi* female (5), male (6); *N. affinis* female (7), male (8).

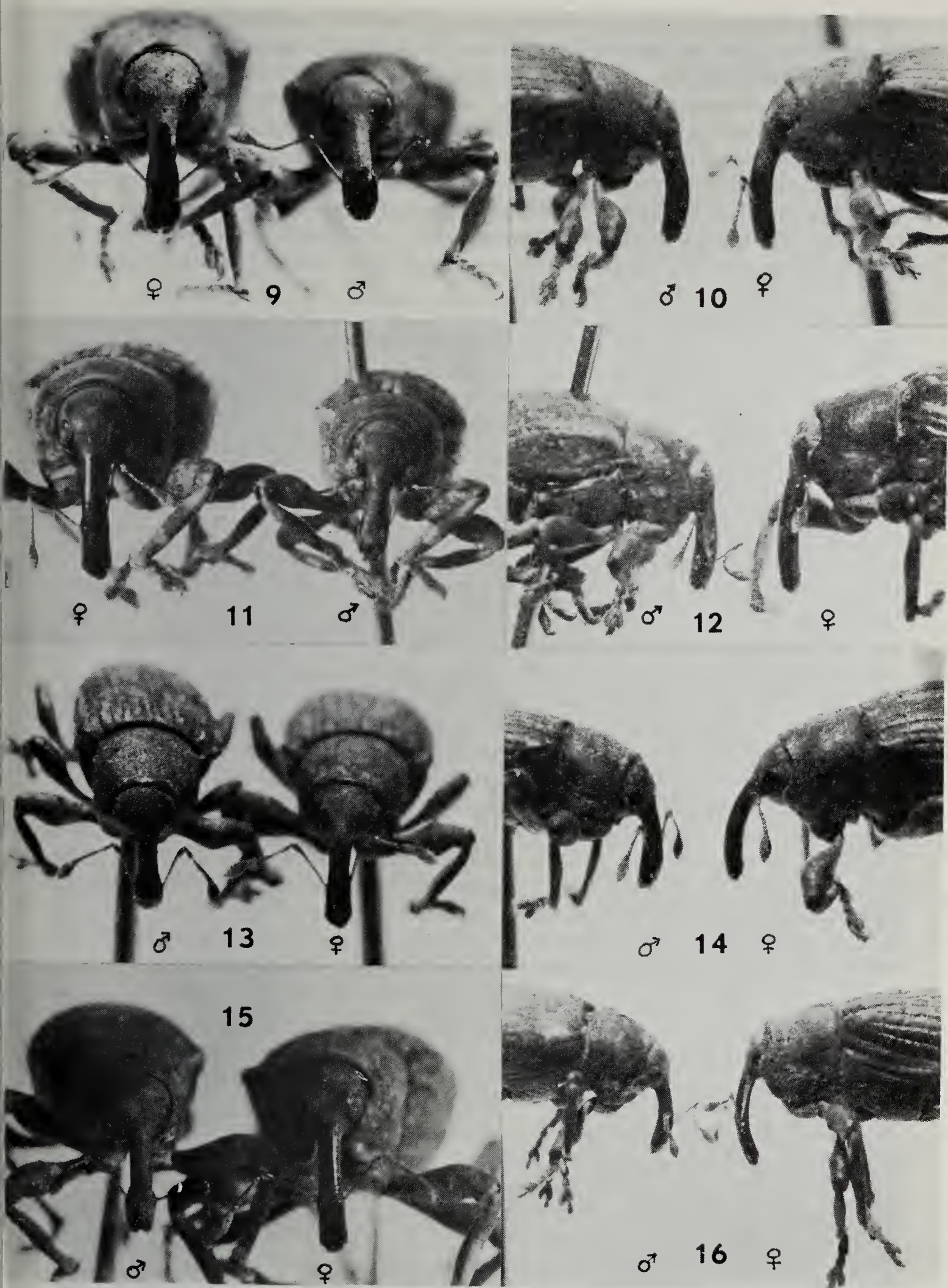


Fig. 9-16: Rostrum of the 4 species of *Neochetina*: (9 and 10) *N. bruchi*; (11 and 12) *N. n. sp.*; (13 and 14) *N. eichhorniae*; (15 and 16) *N. affinis*.

on elytral interval 1 short (0.33 length of thorax) and located behind the anterior margin of the elytra a distance sub-equal to the length of the thorax (Fig. 5, 6); front coxae moderately separated (0.33 of the narrowest width of the rostrum); all 3 tubercles of prosternum behind front coxae well developed and sub-equal (Fig. 17). Rostrum stout, slightly curved, suprascrobal groove indistinct in female, absent in male (Table 1, Fig. 9, 10).

Eggs truncate, length 0.82mm (0.70-1.00mm), width 0.60mm (0.50-0.70mm), ratio w:l = 1.35 (97 eggs measured).

N. eichhorniae Warner

Small species, length of male 4.06mm (3.4-4.5mm), of female 4.52mm (3.8-4.9mm); dark brown to black, without conspicuous markings; carina of 1st elytral interval long (0.5 or more length of thorax) and located anteriorly (behind the anterior margin of elytra a distance of only 0.5 the length of thorax) (Fig. 3, 4); front coxae approximate (separated by 0.1 the narrowest width of the rostrum); latero-posterior tubercles of prosternum behind front coxae distinct but less developed than antero-medial tubercle (Fig. 18). Rostrum slender, of female strongly curved throughout, of male strongly curved and distinctly expanded on distal 0.33, suprascrobal groove quite deep and prominent in female not present in male (Table 1, Fig. 13, 14).

Eggs elongate, small, length 0.88mm (0.70-1.07mm), width 0.44mm (0.40-0.50mm), ratio w:l = 1:2.01; (27 eggs measured).

Separation of the Sexes: Sexes of the species can be separated by the shape of the rostrum, which varies only in degree between the species. Sexual dimorphism in *affinis* and *eichhorniae* is generally more pronounced than in *bruchi* and the n. sp. (see Table 1 and Fig. 1-16 for comparative measurements and illustrations).

Males are smaller than females; rostrum shorter than in female, basal 0.66-0.75 nearly straight and cylindrical, wider and thickened from insertion of antennae to apex, slightly compressed and downward curved beyond antennae; antennae inserted at a distance from the apex of the rostrum equal to less than the width of the rostrum at the point of insertion (only 0.66 this distance in *N. bruchi* and *N. eichhorniae*); rostrum shiny dorsally only from about the insertion of antennae to the apex; carinae when present generally shorter than in the female, front coxae generally more approximate than in female.

Females are larger than the males; rostrum longer, uniformly curved, nearly cylindrical throughout, uniformly increasing slightly in width and thickness from base to apex; antennae inserted at a distance from the apex of the rostrum equal to more than the greatest width of the rostrum (about $1.5 \times$ this distance in *N. affinis* and *N. n. sp.*); rostrum shiny and glabrous from a small distance in front of eye to apex, suprascrobal groove more distinct than in male.

NOTES ON BIOLOGY AND HOST RANGE

The eggs of the species of *Neochetina* are laid beneath the epidermis in the petioles or lamina of the leaves of the host plant. Eggs of *affinis* and *eichhorniae* are long and slender and can be distinguished from the shorter,

thicker eggs of *bruchi* and the n. sp. However, all eggs of *bruchi* cannot be distinguished from all those of the n. sp. because their size ranges overlap. Although the size ranges of *affinis* and *eichhorniae* also overlap, eggs of *eichhorniae* can usually be distinguished because they are soft and flexible for a few days after oviposition, whereas those of the other species are rigid.

The larvae of the species feed inside the petioles, stems, and crowns of the host plants. *N. bruchi* and *N. eichhorniae* have 3 larval instars, *N. affinis* probably has 3 instars, and *N. n. sp.* has not been studied. Mature larvae of *N. bruchi* and *N. eichhorniae* leave their cells inside the crown of the plant and pupate underwater outside among the rootlets. Larvae of *N. affinis*

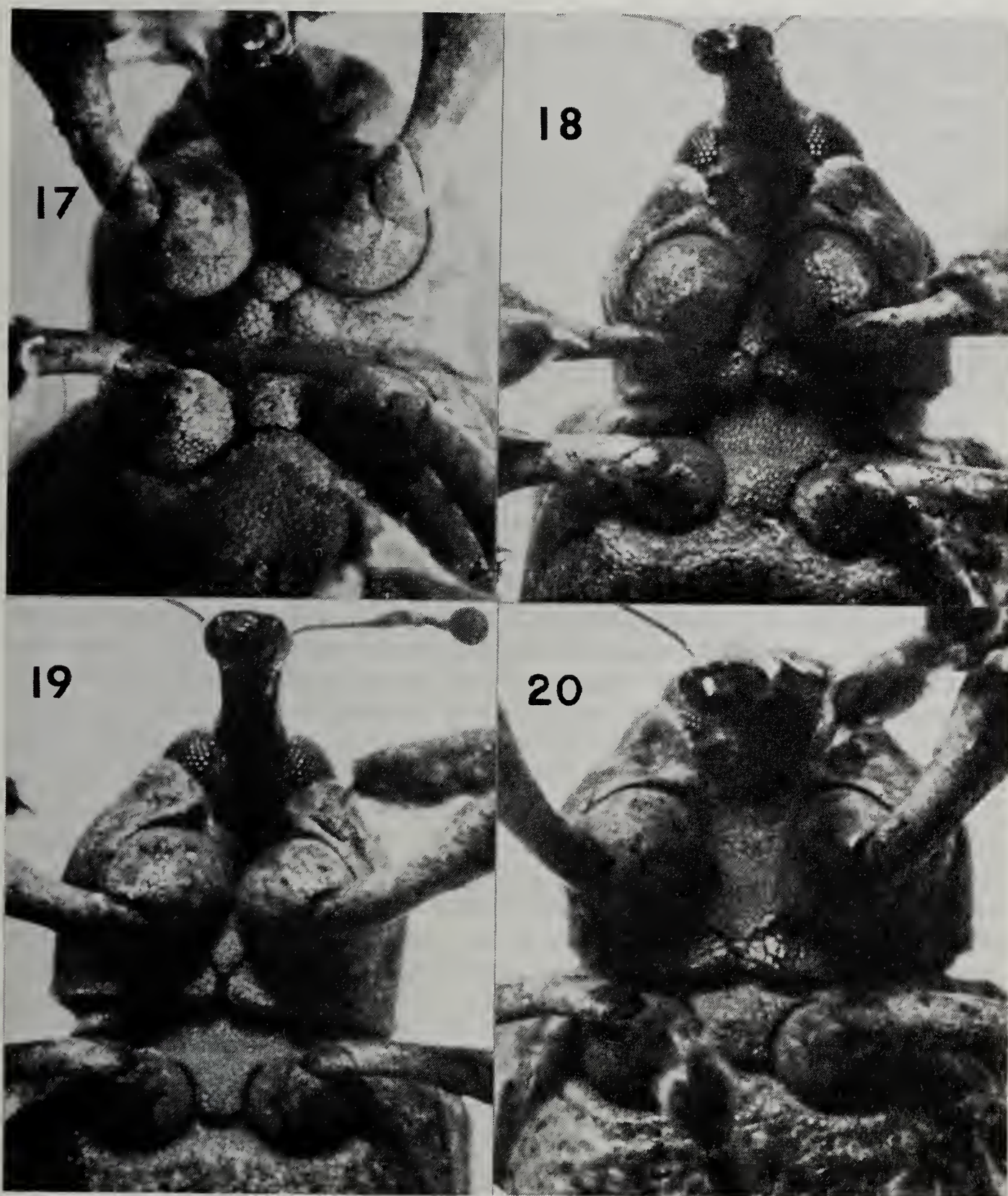


Fig. 17-20: 4 species of *Neochetina*, showing form of the prothoracic tubercles and relative distances between front coxae, (17) *N. bruchi*, (18) *N. eichhorniae*, (19) *N. affinis*, and (20) *N. n. sp.*

pupate inside the stem of the host plant. Pupae of *N. pontederiae* have not been observed. Adults of all 4 species were found between the petioles and underneath the basal bracts near the crown during the day; they apparently fed mostly at night. Several attempts were made to collect from black-light traps beside stands of waterhyacinth at Campana, 70 km N of Buenos Aires, but no *Neochetina* adults were collected; however, O'Brien⁴ mentioned several such collections. One possible explanation is that adult *Neochetina* fly only at certain seasons or under certain physiological conditions which often preclude their capture in light traps.

In the field, both *N. bruchi* and *N. eichhorniae* were common and often abundant on *Eichhornia crassipes* and occasionally were found on *E. azurea* (Swartz) Kunth (DeLoach, in press); *N. affinis* was less abundant, and occurred on *E. azurea*, *Reussia rotundifolia* (L. f.) Castellanos, and to a lesser extent on *Pontederia lanceolata* Nutt. (DeLoach, unpublished reports). These 3 species of *Neochetina* were collected wherever their host plants grew, from Buenos Aires north to Concepción, Paraguay; Warner (1970) reported their occurrence throughout South America.

Neochetina n. sp. was collected only from *P. lanceolata* in the field, but in the laboratory it also fed and oviposited on 3 other species of Pontederiaceae. Several variations in holding conditions were made in an attempt to stimulate egg production, but all were rather unsuccessful. Females laid 6 eggs on *P. lanceolata*, 25 on *E. azurea*, and 5 on *E. crassipes*, but these were not direct comparisons and do not necessarily indicate the degree of host preference.

Several tests were also conducted to measure feeding by adult *N. n.* sp.; they were not consistent in their preference for the 4 species of Pontederiaceae presented in the tests (*E. crassipes*, *E. azurea*, *P. lanceolata*, and *R. rotundifolia*). In the 1st test, a group-plant test comparing 16 test plants, the beetles strongly preferred *E. crassipes*, and did not feed on any plants outside the family Pontederiaceae; they produced 281 feeding spots on *E. crassipes*, 35 on *E. azurea*, 3 on *R. rotundifolia*, and 7 on *P. lanceolata*. When the 4 species of Pontederiaceae were presented together in 1 cage, the weevils slightly preferred *E. azurea* and *R. rotundifolia*, producing 46 feeding spots on *E. crassipes*, 84 on *E. azurea*, 77 on *R. rotundifolia*, and 48 on *P. lanceolata*. When the 4 species of Pontederiaceae were presented separately in no-choice tests over a 2-month period, they preferred to feed on *E. azurea*, and fed least on *P. lanceolata*, producing 521 feeding spots on *E. crassipes*, 854 on *E. azurea*, 410 on *R. rotundifolia*, and 258 on *P. lanceolata*. Although the weevils were originally collected on *P. lanceolata*, it was the least favored host in nearly every test. *Neochetina* n. sp. is probably specific to the family Pontederiaceae as are the other 3 species of the genus. However, it may not be as specific to a single plant species as *N. bruchi* and *N. eichhorniae* are specific to *E. crassipes*; it may be more similar to *N. affinis*, which occurs commonly on 3 species of Pontederiaceae.

Several observations have been made on the host specificity, biology, and ecology of the 4 species of *Neochetina* (DeLoach in press, DeLoach and Cordo^{5,6}), that may have phylogenetic significance. *N. affinis* has a more

⁵DeLoach, C. J., and H. A. Cordo. In Press. Life cycle and biology of *Neochetina bruchi*, a weevil attacking waterhyacinth in Argentina, with notes on *N. eichhorniae*. Ann. Ent. Soc. Amer.

⁶DeLoach, C. J., and H. A. Cordo. In Press. Ecological studies of *Neochetina bruchi* and *N. eichhorniae* on waterhyacinth in Argentina. Hyacinth Control J.

generalized host range on the emergent hydrophyte (*Pontederia*) and the floating-leaved hydrophytes (*Reussia* and *E. azurea*), it pupates inside the stem of the host plant, and it is larger and less active than the other species. *Neochetina* n. sp. is less well known than the other species, but it has been collected only from *Pontederia*, and laboratory tests indicate that it has a more generalized host preference similar to that of *N. affinis*. *N. bruchi* and *N. eichhorniae* have a narrower host range that generally restricts their development to *E. crassipes* (a free-floating hydrophyte) and they have developed a method of pupating underwater that requires an intricate relationship with the suspended roots of the host plant. *N. eichhorniae* is smaller, has greater sexual dimorphism, greater activity and rate of feeding, and a lower reproductive rate than *N. bruchi*; also, its eggs are soft for a day or 2 after oviposition which differs from the rigid eggs of the other species and is probably an adaptation to conditions inside the host plant.

The hypothesis is made that the general trend of specialization has been in the direction of restricted host range, specialized host-plant relationships, smaller size, and greater activity of the weevils. The phylogenetic development of the 4 species of *Neochetina* appears to have paralleled the development of the free-floating trait in the Pontederiaceae. The more generalized species (*N. affinis*) developed on the emergent and floating-leaved hydrophytes (*Pontederia*, *E. azurea*, and *Reussia*) and the more advanced species (*N. bruchi* and *N. eichhorniae*) on a free-floating hydrophyte (*E. crassipes*). *Neochetina* n. sp. occupies an intermediate position; it is morphologically more similar to *N. bruchi* and *N. eichhorniae* but its host plant is the emergent hydrophyte, *Pontederia*.

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